DOCUMENT RESUME

ED 139 526 PS 009 285

AUTHOR Zelniker, Tamar
TITLE Aspects of Information Processing Related to Differences in Conceptual Tempo.
PUB DATE Apr 75
NOTE 12p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Denver, Colorado, April 10-13, 1975)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Cognitive Processes; *Cognitive Style; *Conceptual Tempo; Elementary Education; *Elementary School Students; Grade 4; Measurement Instruments; Reaction Time; Research; *Visual Perception; Visual Stimuli

ABSTRACT

This study investigates the hypothesis that reflective children have a tendency for detailed analysis of information whereas impulsive children process information more globally, and that differences in strategies of visual information processing of these two conceptual style groups lead to superior performance of reflective children insofar as the tasks commonly employed correspond to their processing strategy. New Matching Familiar Figures (MFF) problems were designed and administered to fourth grade children to tap both kinds of strategies. Impulsive children performed better on MFF problems that required "global" analysis than on problems that required "detail" analysis, while reflective children showed the opposite trend. On the basis of these results it is proposed that impulsive children analyze spatial information in large "chunks" and that reflective children analyze such information in small "chunks." It is further proposed that it takes less time to analyze a stimulus if large "chunks" are the units of analysis. It is concluded that although response latency is an important and stable indicator of cognitive style, accuracy varies according to the degree of compatibility between the subject's strategy of analysis and task requirements. No numerical data are included. (Author/SB)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED139526

PS 009285

Aspects of Information Processing Related to Differences in Conceptual Tempo

Tamar Zelniker

Tel-Aviv University

Paper presented at the Biennial Meeting of the Society for Research in Child Development, Denver, Colorado, April, 1975.

Aspects of Information Processing Related to Differences in Conceptual Tempo

Tamar Zelniker

Abstract

We consider the possibility that impulsive children are not inferior to reflective children in their general problem solving ability. Rather, we propose that differences in strategies of visual information processing of these two conceptual style groups lead to superior performance of reflective children in so far as the tasks commonly employed correspond to their processing strategy. We hypothesized that reflective children have a tendency for detailed analysis whereas impulsive children process information more globally. New MFF problems were designed to tap both these strategies. Impulsive children performed better on MFF problems that require "global" analysis rather than on problems that require "detail" analysis, while reflective children showed the opposite trend. On the basis of these results it is proposed that impulsive children analyze spatial information in large "chunks" and that reflective children analyze such information in small "chunks". It is further proposed that it takes less tim to analyze a stimulus if large "chunks" are the units of analysis. The implication of these propositions is that although response latency is an important and stable indicator of cognitive style, accuracy varies according to the degree of compatibility between the subject's strategy of analysis and task requirements.

Aspects of Information Processing

Related to Differences in Conceptual Tempo

Tamar Zelniker

Tel-Aviv University

Reflective children who perform more slowly and more accurately on the MFF test have also been found to be superior to impulsive children on a variety of tasks. In the absence of consistent IQ differences between subjects classified as impulsive and reflective, it seems important to find out whether variables other than general ability or potential may account for differences in problem solving of impulsive and reflective children.

Various performance measures (Kagan, Rosman, Day, Albert & Phillips, 1964; Kagan, 1965) and modification experiments (Egeland, 1974; Heider, 1971; Meichenbaum & Goodman, 1971; Ridberg, Parke & Hetherington, 1971) appear to indicate that the dimension of reflection-impulsivity may be characterized by different strategies of information processing. One possibility that emerges from the data is that reflective children may have a greater tendency than impulsive children to analyze visual stimuli into component details. Conversly, it may be proposed that impulsive children have a greater tendency to focus on the total stimulus or to employ a more global analysis.

Perceptual learning (Odom, McIntyre & Neale, 1971) as well as several of the eye movement studies lend some support to the proposition that impulsive and reflective children may differ in the way they process (visual) information. Indeed, it appears that many of the tasks employed with reflective and impulsive children require attention to details and would therefore, be expected to amplify individual differences in tendency for analysis. The question then, is whether reflective children are superior to impulsive children in general ability or is their superior performance attributable to the nature of their analysis strategy and to the fact that the usual tasks employed required such analysis.

To examine the proposition that reflective and impulsive children employ different strategies of stimulus analysis it is necessary to compare their performance on tasks that differ in the type of analysis they require; one such task should require detailed analysis and the other, global analysis.

Support for the proposed strategy differences would be obtained if each cognitive style group would perform better in tasks that were compatible with their preferred strategy. Specifically, impulsive children should perform better on the "global" than on the "detail" task whereas reflective children should show the opposite trend; that is, perform more poorly on the "global" than on the "detail" task.

To provide such a comparison, we designed "detail" and "global" analysis-demanding problems by drawing new MFF cards. In "detail" cards, variants differed from the standard in some detail inside the figure and in "global" cards the differences were in the contour of the variants. The "global" problems were drawn so that analysis of the stimuli into small component parts would interfere with the solution of the problems. The design of these problems was based on our judgement as to which figures, if analyzed into small sections, would be more difficult to solve than if analyzed more globally. We thought it would be particularly interesting if the MFF test, used to classify subjects as impulsive or reflective, would produce differential effect on the two cognitive style groups as a result of the mere modification of stimulus pictures.

The MFF and the new "detail" and "global" MFF problems were administered to impulsive and reflective fourth-graders, averaging nine years and 5 months of age.

The results of this study showed that overall, reflective children were slower and more accurate than impulsive children. "detail" problems were performed more slowly than "global" problems but

there was no difference in error score between the two tasks. A significant cognitive style by task interaction for response latency indicated that reflective children had shorter latency scores in the "global" than in the "detail" task but no difference was obtained for latency scores of impulsive children in the two tasks.

Most interesting was the significant cognitive style by task interaction which indicated that impulsive children performed significantly more accurately on "global" than on "detail" problems and that reflective children showed the opposite trend, namely, made significantly more errors in the "global" than in the "detail" task. Clearly, this interaction supports the proposed differences in strategy of stimulus analysis of impulsive and reflective children.

It is interesting to note that across cognitive styles, there was no significant difference in number of errors produced in the two tasks. This means that the "global" MFF was not simply easier than the "detail" MFF. Rather, the "global" MFF which was easier than "detail" MFF for impulsive children, turned out to be more difficult than "detail" MFF for reflective children.

While the greater accuracy of impulsive as compared to reflective children on the "global" MFF did not reach significance, impulsive children were nevertheless superior to reflective children in that task

in that they performed the task significantly faster than reflective children.

The fact that the relative speed and accuracy of impulsive and reflective children was the same in the"detail" MFF and the standard MFF but not in the "global" MFF, supports the notion that in the standard MFF subjects are required to analyze stimuli into component details and impulsive subjects are inferior on that task due to their global strategy of analysis.

The results, then, demonstrate that strategy of analysis is an important, though, not necessarily the only, variable underlying the reflection-impulsivity dimension.

This experiment led us to consider a number of propositions, suggested by the data, which provide an explanation for a large volume of accumulated research in this area as well as guidlines for further research.

First it is proposed that strategy of analysis is determined by the size of spatial units (chunks) of information processed, respectively, by impulsive and reflective children. Specifically, it is proposed that global analysis, typical of impulsive children, involves processing stimuli in large chunks and that detailed analysis of reflective children

involves processing stimuli in small chunks. Naturally, processing based on large chunks entails detection of fewer details and consequently, low accuracy on tasks in which solution of the problem requires detection of such details.

Secondly, it is proposed that the size of chunks is related to speed of performance; the larger the size of the chunks, the faster the scanning of a given stimulus area.[1]

The above propositions bear directly on the characterization of the reflection-impulsivity dimension in terms of observable behavior measures of speed and accuracy. These propositions suggest that response latency, associated with strategy of analysis, is an important and stable indicator of cognitive style. It follows that the same relative speed of impulsive and reflective children should be found in different tasks involving analysis of visual stimuli.

Relative accuracy, on the other hand, might vary, depending on the relationship (compatibility or incompatibility) between strategy of analysis and the task or stimuli employed. It is, thus, not a stable index of cognitive style, neither does it reflect the subjects' general ability or problem solving competence. Rather, it reflects specific ability to solve problems with specific requirements.

An additional prediction based on the propositions described above, is that speed and accuracy should be negatively correlated for impulsive and reflective children on tasks which require detailed analysis (e.g., the MFF) but may be independent on other tasks. The findings of the study described earlier are in line with this prediction. In fact, prolonged response latency of impulsive children on the MFF has been reported to occur in modification studies without increase in accuracy, and increase in accuracy on this task has also been reported to occur without prolonged response latency.

According to our propositions, mere increase in response latency of impulsive children should not affect their accuracy, as during the additional period of time impulsive children would most likely continue to process information in large chunks, which would not lead to detection of small differences required for correct solution. Rather it seems that the best way to improve impulsive childrens' performance would be to adapt tasks to their specific strategy of analysis. As we can now predict in which types of tasks impulsive children are likely to succeed, we can redesign problems in a way that would maximize impulsive children's success.

However, in situations where detailed analysis is mandatory, the above propositions could also be useful in suggesting guidelines for

training impulsive children; drawing their attention to small details should proceed by presenting them initially, with small isolated chunks rather than a detail embedded in a complex large chunk. While a small chunk which is part of a complex chunk would probably be missed altogether, by impulsive children, an isolated small chunk would be more likely to be noticed. A fading or other graduated training should then follow with the aim of training children to analyze stimuli when necessary, into small chunks even when the stimuli are complex.

Finally, it appears to us that differences in strategies of analysis are generalized to various cognitive functions and are reflected in different modalities as well as different levels of complexity of cognitive functioning. We observed the generality of differences in processing strategies of impulsive and reflective children in our own work with tasks employing both verbal and nonverbal material, both visually and auditorily presented stimuli, requiring both verbal and nonverbal responses and ranging from visual matching and grouping to recall and concept formation.

References

Egeland, B. Training impulsive children in the use of more efficient scanning techniques. Child Development, 1974, 45, 165-171.

Heider, E. R. Information processing and the modification of an "impulsive conceptual tempo." Child Development, 1971, 42, 1276-1281.

Kagan, J. Impulsive and reflective children: Significance of conceptual tempo. In J. Krumboltz (Ed.). Learning and the educational process. Chicago: Rand-McNally, 1965.

Kagan, J., Rosman, B. L., Day, D., Albert, J. & Phillips, W. Information processing in the child: Significance of analytic and reflective attitudes. Psychological Monographs, 1964, 78 (1. Whole No. 578).

Meichenbaum, D., & Goodman, J. Training impulsive children to talk to themselves: A means of developing self-control. Journal of Abnormal Psychology, 1971, 77, 115-126.

Odom, R. D., McIntyre, C. W., & Neale, G. S. The influence of cognitive style on perceptual learning. Child Development, 1971, 42, 883-891.

Ridberg, E. H., Parke, R. D., & Hetherington, E. M. Modification of impulsive and reflective cognitive styles through observation of film-mediated models. Developmental Psychology, 1971, 5, 369-377.